

**Wisconsin Highway Research Program
Request for Proposal for**

Base Compaction Specification Feasibility Analysis

**Proposals must be submitted
no later than
Wednesday, March 3rd, 2010**

**For further information regarding this RFP
contact Andrew Hanz
at (608) 262-3835
E-mail: ajhanz@wisc.edu**

Wednesday, January 27th, 2010

Researcher Proposal Preparation Guidelines

WHRP Proposal Guidelines are available on the WHRP website (<http://www.whrp.org/rfps-and-guidelines.html?current=three&sub=none>). Please refer to these instructions in preparation of your response.

I. Background and Problem Statement

For approximately the last fifteen years WisDOT construction specifications have been transitioning from “method” specifications to “performance” specifications. WisDOT’s Base Aggregates specifications are a set of specifications that have not yet made that transition. These specifications rely on construction method terms such as “Standard Compaction” to provide contractors and department construction managers and inspectors with the necessary guidance and acceptance measures to construct good performing quality aggregate bases. Review of the “Standard Compaction” description reveals the use of ambiguous and rather subjective terminology such as “appreciable displacement”. WisDOT SS 301 also uses terms such as “soft” and “spongy” in identifying adequate foundation preparation prior to base aggregate placement. This leads to accepted base layers that exhibit variable stiffness values that contribute to HMA pavement performance issues.

Flexible pavement design includes unbound granular layers (as defined by WisDOT SS 305) as part of the overall pavement structure. Pavement designers would be able to increase a pavement design’s cost effectiveness if a pavement material’s engineering properties are more consistent and correlated to specification performance criteria. A base aggregate specification that is based on performance criteria for compaction will improve pavement structural designs and also reduce construction costs and delays arising from base failures during construction.

Many other SHAs are using performance based specifications for base aggregates, what is the feasibility for WisDOT to transition to this type of specification in order to realize better cost savings related to HMA expenditures and resultant pavement performance?

II. Objectives

The proposed research will establish the technical engineering and cost analysis that will allow WisDOT Management to objectively evaluate the feasibility of switching specification philosophies for base aggregate materials. The proposed research will also provide technical recommendations for a proposed performance based base aggregate specification. The proposed performance based specification should utilize performance criteria in terms of a minimum and uniform stiffness measurement parameter consistent with modern technology and MEPDG pavement design input parameters. Furthermore, these criteria should be consistent with other pavement layer performance based specifications.

III. Scope of Work

- a) Work Plan Tasks will include but are not limited to:
 - i) Literature search summarizing SHA’s base aggregate compaction specification method (method/performance based), performance criteria evaluated, method of measuring performance criteria, and past WisDOT efforts evaluating the performance properties of base layer materials. At a

- minimum. WHRP project 0092-02-01 will be reviewed. The report is available on the WHRP website (<http://www.whrp.org/research-areas/geotechnics/geotechnics.html>).
- ii) Development of a data base of a minimum of ten DOT construction projects to be evaluated for base stiffness variability. Efforts should be made to coordinate the projects used to populate the database with materials used in previous WHRP studies.
 - Flexible pavements constructed over base materials as defined by WisDOT SS 305 built since 2000
 - Survey DOT & contractor personnel and review project diaries identifying the base aggregate construction information.
 - Incorporate WisDOT Pavement Inventory File (PIF) pavement performance data
 - iii) Review of field data base projects: conduct PCI distress survey, and FWD testing of base compaction failure location and remaining project at 500' intervals (comparative of stressed areas and adjacent good performance).
 - iv) Identify and procure representative base aggregate materials for laboratory evaluation
 - v) If required, evaluate the laboratory resilient modulus testing (similar to the WHRP studies) to establish realistic MEPDG input values in the following task.
 - vi) Perform MEPDG sensitivity and cost analysis of resilient modulus values for base layers in a flexible pavement design utilizing laboratory values and documented field variability established in the previous tasks.
 - vii) Analyze collected laboratory and field data.
 - viii) Develop a framework for a Base Aggregate specification that incorporates compaction performance criteria.
 - b) WisDOT/TOC Contribution: 40 hours (establish project list, solicit survey response) and ten field days usage of WisDOT's FWD equipment (fuel excluded). The researcher will be required to coordinate the use of WisDOT's FWD equipment with the state in advance.
 - c) Requirements for Laboratory/Technician Certifications: NONE
 - d) Required travel to fulfill TOC Obligations: Field data collection, 1 on-site meeting

IV. **Specific Results, Findings, Tools, etc. (Deliverables)**

- a) Result tables & Graphics in electronic format suitable for incorporation in a PowerPoint presentation for the following:
 - Laboratory Testing
 - Flexible Pavement Design Sensitivity
 - Project FWD Analysis
 - Laboratory & Field Correlations of Resilient Modulus
- b) Recommended Base Aggregate Specification that incorporates compaction performance criteria (incorporating WisDOT's direction related to MEPDG inputs)
- c) Feasibility recommendation based on engineering principles and costs.

- d) Reporting Requirements. 15 Hard Copies Delivered to WHP by the contract end date.
- e) Presentation Requirements. The PI is to give a closeout presentation after submittal of the draft final report.

V. Budget and Time Frame

- d) Project Duration is intended to be 12 months for work plan Tasks with an additional 3 months for project close-out activities (October 2010 – December 2011).
 - i) Deadline for submittal of a Draft Final Report: September 30, 2011.
 - ii) Deadline for submittal of Final Report: December 31, 2011
- e) Project Budget: \$92,000 (FWD Testing Traffic Control is to be included in total amount and also itemized as a cost per testing day)

VI. Implementation

- a) General areas of specifications and practices that the research has potential to impact:
 - i. Specifications: SS 301.3.2, 301.3.4.2, 301.3.4.3
 - ii. Contract Administration Guidance: CMM Chapter 3
 - iii. Facilities Development Manual: 14-10-5
- b) Researcher is expected to communicate the following:
 - i) Potential changes in practice.
 - ii) Benefits in terms of performance and cost savings.
- c) Tools to facilitate implementation.